| Table B-3: Arnot & Gobas Equations | | | |
|---|---|---|---|
| **Biological** | | | |
| **Component** | **Symbol** | **Units** | **Equation** |
| Chemical concentration in the organism | $C_B$ | pg/kg ~~WW~~ww | $C_B = \{k_1*(m_O*C_{WD}+m_P*C_{WD.P}) + k_D * \Sigma Pi*C_{D,i}\}/(k_2+k_E+k_c+k_M)$ **Equation 1** |
| Chemical concentration in prey item *i* | $C_{D,i}$ | pg/kg ww | same as above; included to indicate that the general equation is also used to estimate chemical concentrations in prey species **Equation 1** |
| Organism-water partition coefficient on a wet weight basis | $K_{BW}$ | unitless | $K_{BW}=k_1/k_{2=}v_{LB}*K_{OW}+V_{NP}*\beta*K_{OW}+v_{WP}$ **Equation 2** |
| Rate constant for aqueous uptake (fish, invertebrates and zooplankton) | $k_1$ | L/kg/day | $k_1 = E_w*G_v/W_B$ **Equation 4** |
| Gill ventilation rate | $G_V$ | L/d | $G_V= 1400*W_B^{0.65}/C_{OX}$ **Equation 5** |
| Respiratory surface chemical uptake efficiency | $E_w$ | unitless | $E_w= (1.85 + (155/K_{ow}))^{-1}$ **Equation 7** |
| Rate constant for aqueous uptake (algae, phytoplankton and aquatic macrophytes) | $k_1$ | L/kg/day | $k_1 = (A+(B/K_{ow}))^{-1}$ (A and B values from literature) **Equation 8** |
| Rate constant for chemical elimination via the respiratory area (gill) | $k_2$ | $day^{-1}$ | $k_2 = k1/K_{BW}$ **Equation 9** |
| Phytoplankton-water partition coefficient on a wet weight basis | $K_{PW}$ | unitless | $K_{PW} = v_{LP}*K_{OW} + v_{NP}*0.35*K_{OW} + v_{WP}$ **Equation 10** |
| Rate constant for chemical uptake via ingestion and digestion of food and water | $k_D$ | kg food/kg organism/day | $k_D = E_D*G_D/W_B$ **Equation 11** |
| Dietary chemical transfer efficiency | $E_D$ | unitless | $E_D= (3.0*10^{-7}*K_{OW}+2.0)^{-1}$ **Equation 12** |
| Feeding rate - other species | $G_D$ | kg/d | $G_D = 0.022*W_B^{0.85}*e^{(0.006*T)}$ **Equation 13** |
| Feeding rate - filter-feeders | $G_D$ | kg/d | $G_D=G_V*C_s*\sigma$ **Equation 14** |

**Commented [BLJ1]:** Changed case to be consistent with rest of document.

**Commented [BLJ2]:** Two Equation 1's

**Commented [BLJ3]:** No Equation 3
(OK. I found it below. Perhaps you should put an empty row here and indicate in that row that "(Equation 3 is found below in the discussion of chemical model components)" Alternatively, perhaps it would better to renumber equations.

**Commented [BLJ4]:** No Equation 6. (See comment on equation 3 above.)

**Commented [BLJ5]:** No decimal point in original. Is this correct?

**Commented [BLJ6]:** Sigma term not defined. Might there be other terms in this table that are similarly not defined??

| **Table B-3: Arnot & Gobas Equations** | | | |
|---|---|---|---|
| **Component** | **Symbol** | **Units** | **Equation** |
| Rate constant for chemical elimination via excretion into egested feces | $k_E$ | $day^{-1}$ | $k_E = G_F * E_D * K_{GB} / W_B$<br><br>**Equation 15** |
| Partition coefficient of the chemical between the contents of the gastrointestinal tract and the organism | $K_{GB}$ | unitless | $K_{GB} = (v_{LG} * K_{OW} + v_{NG} * \beta * K_{OW} + v_{WG}) / (v_{LB} * K_{0W} + v_{NB} * \beta * K_{OW} + v_{WB})$<br><br>**Equation 16** |
| Fecal egestion rate | $G_F$ | kg/d | $G_F = \{ (1-\delta_L) * V_{LD}) + (1-\varepsilon_L) * V_{ND} + (1-\varepsilon_N) * V_{WD} \} * G_D$<br>**Equation 17** |
| Lipid fraction of gut contents | $v_{LG}$ | kg lipid/kg digesta ww | $v_{LG} = (1-\varepsilon_L) * v_{LD} / [(1-\varepsilon_L) * v_{LD} + (1-\varepsilon_N) * v_{ND} + (1-\varepsilon_W) * v_{WD}]$<br>**Equation 18** |
| NLOM fraction of gut contents | $v_{NG}$ | kg NLOM/kg digesta ww | $v_{NG} = (1-\varepsilon_L) * v_{ND} / [(1-\varepsilon_L) * v_{LD} + (1-\varepsilon_N) * v_{ND} + (1-\varepsilon_W) * v_{WD}]$<br>**Equation 19** |
| Water fraction of gut contents | $v_{WG}$ | kg water/kg digesta ww | $v_{WG} = (1-\varepsilon_L) * v_{WD} / [(1-\varepsilon_L) * v_{LD} + (1-\varepsilon_N) * v_{ND} + (1-\varepsilon_W) * v_{WD}]$<br>**Equation 20** |
| Rate constant for growth of aquatic organisms | $k_G$ | $day^{-1}$ | $K_G = 0.0005 \times W_B^{-0.2}$<br>**Equation 21** |
| Rate constant for metabolic transformation of chemical | $k_M$ | $day^{-1}$ | Metabolism of PCB and DDE are not expected to be significant for application of the model to Portland Harbor. Estimates for $k_M$ were, however, identified in the model calibration process |
| Overall lipid content of the diet | $v_{LD}$ | kg lipid/kg food ww | $v_{LD} = \Sigma P_i * v_{LB,i}$<br>**Total dietary lipid** |
| Overall NLOM content of the diet | $v_{ND}$ | kg NLOM/kg food ww | $v_{ND} = \Sigma P_i * v_{NB,i}$<br>**Total dietary non-lipid organic matter** |
| Overall water content of the diet | $v_{WD}$ | kg water/kg food ww | $v_{WD} = \Sigma P_i * v_{WB,i}$<br>**Total dietary water** |
| **Chemical** | | | |
| **Component** | **Symbol** | **Units** | **Equation** |
| Bioavailable Solute Fraction | $\phi$ | unitless | $\phi = 1/(1+\chi_{POC} * D_{POC} * \alpha_{POC} * K_{OW} + \chi_{DOC} * D_{DOC} * \alpha_{DOC} * K_{OW})$<br>**Equation 3** |
| Dissolved oxygen concentration of water (RM 2 to RM 11) | $C_{OX}$ | mg $0_2$/L | $C_{OX} = (-0.24 * T + 14.04) * 0.9$<br><br>**Equation 6** |

| Table B-3: Arnot & Gobas Equations | | | |
|---|---|---|---|
| **Component** | **Symbol** | **Units** | **Equation** |
| Freely dissolved chemical concentration in the pore water | $C_{WD,P}$ | ng/L | $C_{WD,P} = C_{S,OC} * \delta_{OCS} / K_{OC}$<br><br>**Equation 22** |
| Chemical concentration in the sediment, organic carbon normalized | $C_{S,OC}$ | pg/kg dw OC | $C_{S,OC} = C_S / OC_{sed}$<br><br>**Equation 23** |
| Freely dissolved chemical concentration in the water (total PCBs as congeners and 4,4'-DDE) | $C_{WD}$ | ng/L | $C_{WD} = C_{WT} * \phi$<br><br>(See Equation 1) |
| Organic carbon-water partition coefficient (total PCBs as Aroclors and 4,4'-DDE) | Log Kqc | unitless | $\text{Log } K_{OC} = \text{Log}_{10}(0.35 * 10^{\text{Log Kow}})$ |

**Commented [BLJ7]:** I don't believe this is defined elsewhere. (I found it in text, but perhaps it could be defined here as well to make table useful independent of text.)